

ANALYSIS OF GUTHION RESIDUES ON PEACH FOLIAGE BEFORE
EXPIRATION OF WORKERS SAFETY INTERVAL IN STANISLAUS
COUNTY IN CALIFORNIA DURING JUNE 1981

by

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SUMMARY

Three peach orchards in Stanislaus County, California, were sampled for foliar residues of Guthion (azinphosmethyl) over a 15-day period post-application during August 1981. The dislodgeable Guthion residues found were not greater than 2.48 ug/cm^2 , with no detectable levels of the Guthion oxon found in these three groves (minimum detectable level 55 ug/sample GC and 25 ug/sample LC). Using Knaak's and Iwata's safe foliage level of 3.0 ug/cm^2 , this orchard would probably have been safe for worker reentry upon expiration of the 14-day reentry period provided the field workers had baths daily and clean clothes daily to avoid accumulation of residues that could be absorbed through the skin.

INTRODUCTION

Guthion (azinphosmethyl) is a Class I organophosphate insecticide extensively used on peaches, plums, and other stone fruit crops. Symptoms of organophosphate poisoning are caused by cholinesterase inhibition. Guthion has an oral LD₅₀ (rat) of 13 mg/kg and a dermal LD₅₀ (rat) of 220 mg/kg.

There have been 66 reported cases of Guthion intoxication between 1976 and 1980. These poisoning incidents have been attributed largely to dermal exposure to foliage residue. This study was conducted to evaluate Guthion and Guthion oxon residue levels and their rate of decay on peach foliage. A majority of the samplings were made during or before the expiration of the 14-day worker reentry period.

Guthion is usually marketed as a wettable powder and as an emulsifiable liquid. The formulation used for this study was 50 WP Guthion.

METHODS AND MATERIALS

The owners of Guthion-treated peach orchards were contacted and permission to sample the foliage was obtained. The orchards are identified as Field 1, Field 2, and Field 3. Field 1 was sampled at time intervals of 8 hours, 24 hours, 7 days, and 15 days post-spray. Field 2 was sampled at time intervals of 48 hours, 6 days, and 14 days post-spray. Field 3 was sampled at time intervals of 24 hours, 48 hours, 5 days, and 12 days post-spray. The rates of application were given as 2 lb. a.i./500 gal. per acre to Field 1, 1-1/2 lb. a.i./500 gal. per acre to Field 2, and 2.25 lb. a.i./500 gal. per acre to Field 3.

Leaf samples were taken using a 2.54 cm diameter leaf punch. Each sample set contained 40 leaf discs, obtained from 4 sides of 10 different trees. Two rows of 10 trees were sampled in crossing diagonally through the field with duplicate samples taken simultaneously. Thus, the total number of leaf discs per field was 160, divided into 4 samples. The sample jars were covered with foil, capped, and stored on wet ice. The leaf puncher was cleaned with ethanol between punch sets.

The procedure used for the extraction of dislodgeable, penetrated, and total residues from leaf punches was originally published by Gunther in "The Bulletin of Environmental Contamination and Toxicology," 9, 243-249, 1973. It has been documented several times in detail with modifications that were made to accommodate the various pesticides and their metabolites that the Worker Health and Safety Unit has been concerned with.

The sample container and leaf punches are weighed and the gross weight recorded.

All samples, including duplicates, were analyzed for azinphosmethyl and its oxon.

Because of circumstances beyond the laboratories control, Guthion oxon samples were not analyzed until November. The samples were stored in a freezer before analysis. Both gas chromatography and liquid chromatography methods were used for the analysis. Laboratory methodologies are given in the Appendix.

RESULTS

TABLE ONE: Guthion and oxon residue levels and sample weight.

TABLE TWO: Residue levels of Guthion at Field 1 arranged by time.

TABLE THREE: Residue levels of Guthion at Field 2 arranged by time.

TABLE FOUR: Residue levels of Guthion at Field 3 arranged by time.

GRAPH A: Dislodgeable Guthion decay curve at Field 1.

GRAPH B: Dislodgeable Guthion decay curve at Field 2.

GRAPH C: Dislodgeable Guthion decay curve at Field 3.

DISCUSSION

According to Knaak and Iwata (HS-810, CDFA) the safe level of azinphosmethyl alone on foliage is estimated to be 3.0 ug/cm^2 . Since none of the results showed a dislodgeable foliage residue level greater than 2.48 ug/cm^2 during the 15-day sampling period, the established reentry period was adequate when applied to the application rates in the fields used in this study. However, some variables were not accounted for, leaving some possibility for error in applying these decay rates to other field applications. Since there was no Guthion oxon found, this may have been due to the prolonged storage of the samples.

The decay rates were fairly linear, with only one anomalous point appearing on the graph of Field 1. However, the upper range of that point does lie on the actual decay curve. The addition of that point does not significantly alter the shape of the curve.

TABLE ONE
Guthion and Guthoxon Residues
and Sample Weight

Sample #	Guthion (Dislodgeable) [ug/cm ²]	Guthoxon [M.D.L. 55 ug/sample*]	Weight [grams]
14-1	1.81	ND*	3.0
14-2	1.7	ND*	3.04
14-3	1.34	ND*	3.24
14-4	1.52	ND*	3.41
14-5	2.06	ND*	3.26
14-6	1.56	ND*	3.33
14-7	1.62	ND*	2.98
14-8	1.48	ND*	2.98
14-9	1.49	ND*	2.92
14-10	1.15	ND*	3.13
14-11	1.43	ND*	3.22
14-12	1.37	ND*	3.13
14-13	1.98	ND*	3.09
14-14	1.87	ND*	3.04
14-15	2.26	ND*	3.39
14-16	2.27	ND*	3.32
14-17	2.12	ND	3.36
14-18	1.48	ND	3.19
14-19	2.48	ND*	3.25
14-20	2.23	ND	3.33
14-21	1.1	ND*	3.12
14-22	1.97	ND	3.24
14-23	1.48	ND	3.10
14-24	0.79	ND	3.09
14-25	1.34	ND	3.51
14-26	0.96	ND	3.15
14-27	1.24	ND	3.10
14-28	1.39	ND	3.11
14-29	1.69	ND	3.15
14-30	1.60	ND	3.05
14-31	1.64	ND	3.06
14-32	1.75	ND	3.16
14-33	0.98	ND	3.18
14-34	0.95	ND	3.04
14-35	0.72	ND	2.84
14-36	0.70	ND	3.03
14-37	0.31	ND	3.29
14-38	0.24	ND	3.26

* Starred entries done by L.C. with 25 ug/cm² MDL, otherwise done by G.C. with 55 ug/cm² MDL.

Sample #	Guthion (Dislodgeable) [ug/cm ²]	Guthoxon [M.D.L. 55 ug/sample*]	Weight [grams]
14-39	0.42	ND	3.39
14-40	0.42	ND	3.39
14-41	0.42	ND	3.15
14-42	0.26	ND	3.32
14-43	N/A Destroyed	ND	3.80
14-44	0.55	ND	3.68
14-45	0.078	ND	3.15
14-46	0.088	ND	3.05
14-47	0.21	ND	3.68
14-48	0.10	ND	2.97
14-49	1.08	ND	2.98
14-50	1.31	ND	3.12
14-51	1.45	ND	3.07
14-52	0.88	ND	3.07

TABLE TWO
Dislodgeable Residue Levels at Field 1

Sample #	Time	Guthion (Dislodgeable)	Average
14-1	8 hour	1.81	8 hour - 1.59
14-2	8 hour	1.7	
14-3	8 hour	1.34	
14-4	8 hour	1.52	
14-5	24 hour	2.06	24 hour - 1.68
14-6	24 hour	1.56	
14-7	24 hour	1.62	
14-8	14 hour	1.48	
14-49	7 day	1.08	7 day - 1.18
14-50	7 day	1.31	
14-51	7 day	1.45	
14-52	7 day	0.88	
14-41	15 day	0.42	15 day - .41
14-42	15 day	0.26	
14-43	15 day	N/A	
14-44	15 day	0.55	

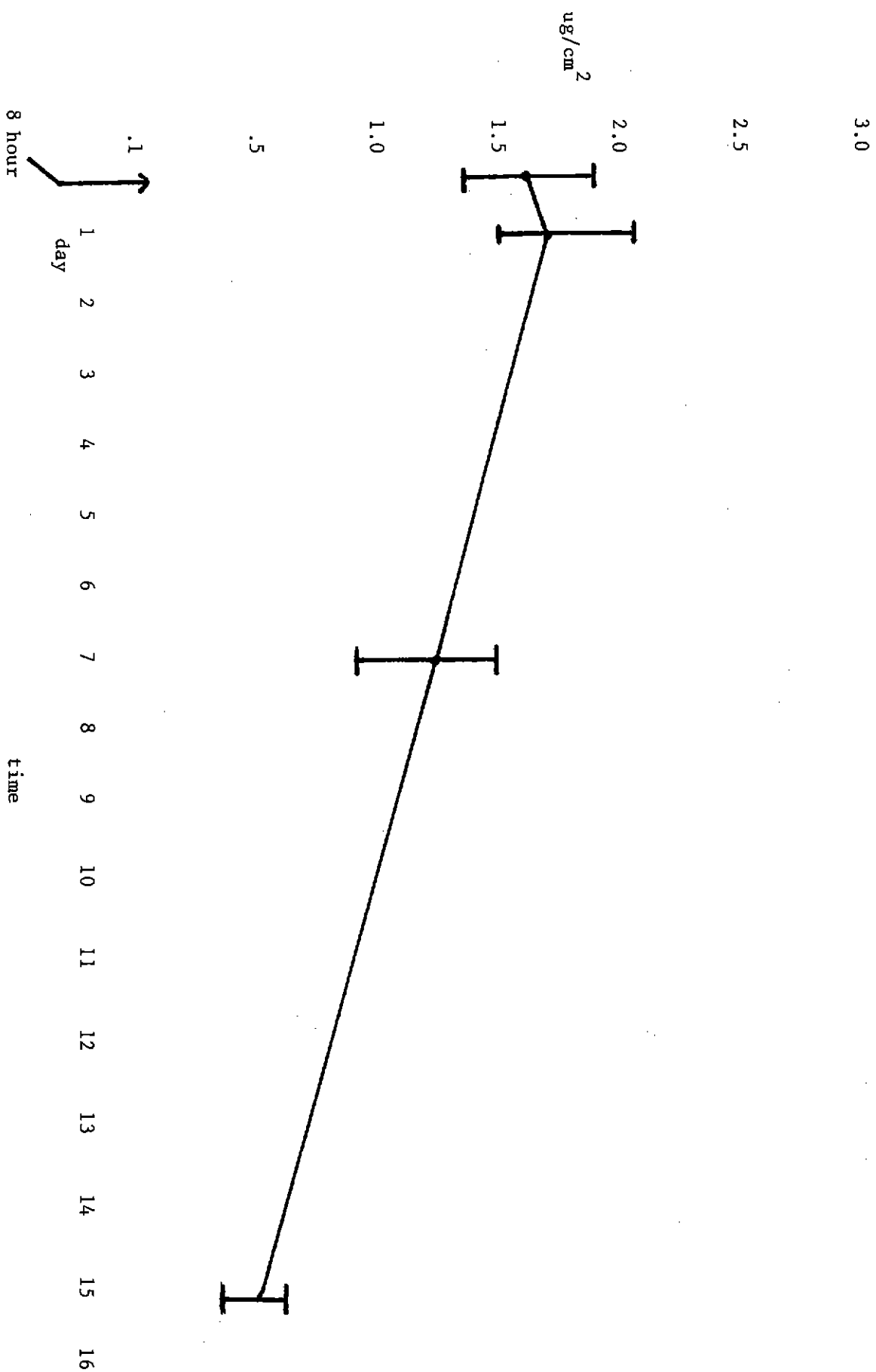
TABLE THREE
Dislodgeable Residue Levels at Field 2

Sample #	Time	Guthion (Dislodgeable)	Average
14-17	48 hour	2.12	48 hour - 2.1
14-18	48 hour	1.48	
14-19	48 hour	2.48	
14-20	48 hour	2.32	
14-29	6 day	1.69	6 day - 1.67
14-30	6 day	1.60	
14-31	6 day	1.64	
14-32	6 day	1.75	
14-45	14 day	0.078	14 day .119
14-46	14 day	0.088	
14-47	14 day	0.21	
14-48	14 day	0.10	

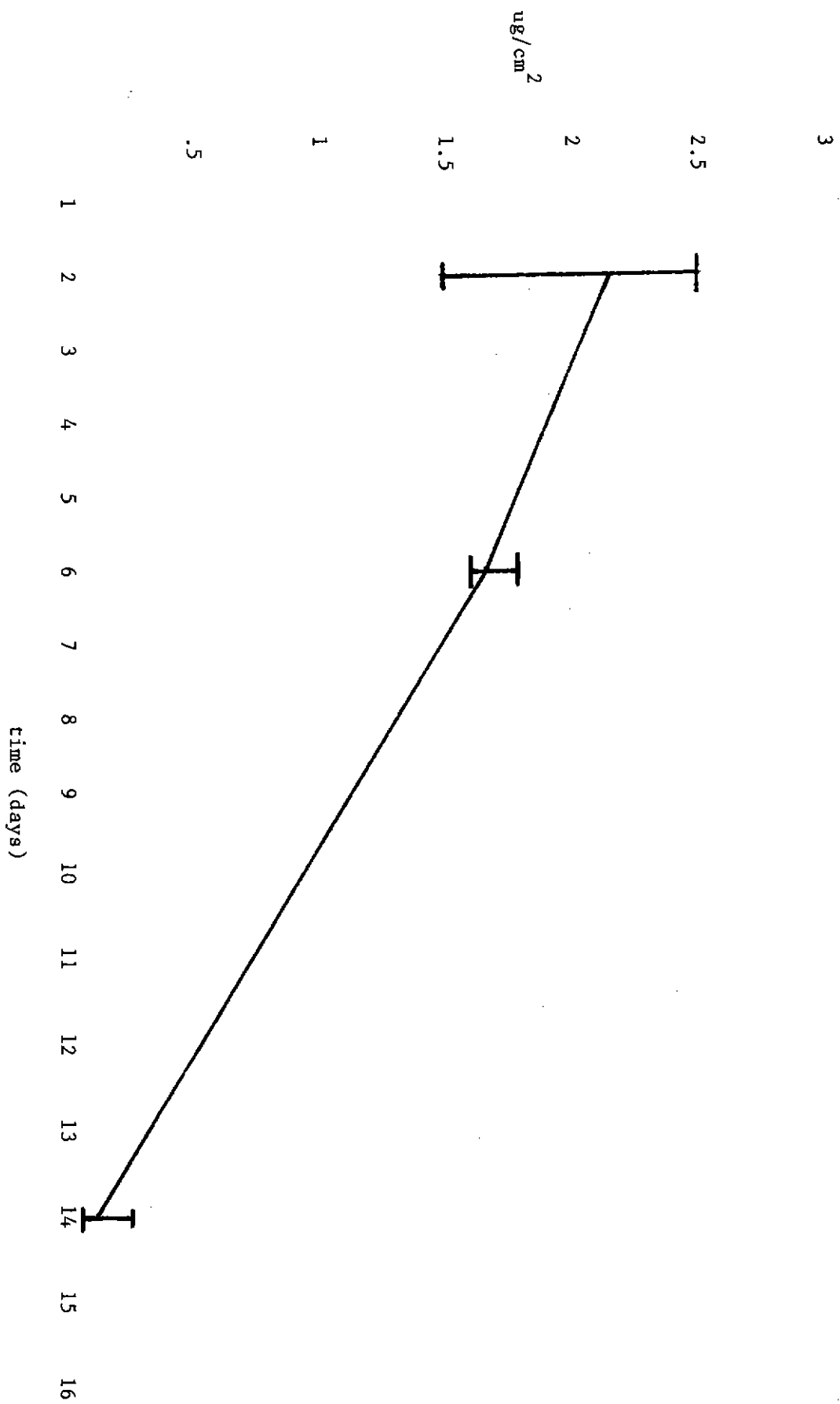
TABLE FOUR
Dislodgeable Residue Levels at Field 3

Sample #	Time	Guthion (Dislodgeable)	Average
14-21	24 hour	1.1	24 hour - 1.34
14-22	24 hour	1.97	
14-23	24 hour	1.48	
14-24	24 hour	0.79	
14-25	48 hour	1.34	48 hour - 1.23
14-26	48 hour	0.96	
14-27	48 hour	1.24	
14-28	48 hour	1.39	
14-33	5 day	0.98	5 day - .84
14-34	5 day	0.95	
14-35	5 day	0.72	
14-36	5 day	0.70	
14-37	12 day	0.31	12 day - .35
14-38	12 day	0.24	
14-39	12 day	0.42	
14-40	12 day	0.42	

GRAPH A
Dislodgeable Guthion Decay Curve at Field 1



GRAPH B
Dislodgeable Guthion Decay Curve at Field 2



GRAPH C
Dislodgeable Guthion Decay Curve at Field 3

